

Design of IOT-Based Body Temperature Monitoring Prototype at Syekh-Yusuf Islamic University Tangerang Using Black Box Testing Method

Wulan Kurniawati¹, Asep Abdul Sofyan², Fauzi³, Haryanto⁴, Djamaludin⁵
Universitas Islam Syekh Yusuf Tangerang, Indonesia^{1,2,3,4,5}
wulankurniawati546@gmail.com¹, asep.abdulsofyan@unis.ac.id², fauzi@unis.ac.id³,
haryanto@unis.ac.id⁴, djamaludin@unis.ac.id⁵

Abstract

The spread of the Coronavirus Disease (Covid-19) virus since 2019 has caused a pandemic in this world. Generally, the existing body temperature checkers only function to check the temperature, and allow someone to escape from the process. By utilizing the Internet of Things, it is possible to make a body temperature checking device that can measure measurement data into a database, and display it on a smartphone through an application and this tool is named the Design and Build of a Prototype of Internet of Things-Based Body Temperature Monitoring. The tool uses an infrared temperature sensor which functions to measure contactless body temperature and before using the sensor must be accessed using a Radio Frequency Identification (RFID) card so that data that has checked body temperature can be stored. The data is stored in a database and can also be accessed in the form of a website using the black box testing method. This method is used to find out if the software is working properly. With this tool the screening process becomes more leverage, because the tool can record the temperature of the user of the tool and can store it in the database.

Keywords: temperature, rfid, database, website, black box testing

INTRODUCTION

Technological developments have become very useful in the current pandemic conditions, implementing health protocols is one of the efforts to prevent the spread of the Covid-19 virus. Body temperature is an indicator for people with Covid-19 symptoms. Measuring body temperature is a way to avoid cases of spreading this virus.

In practice, checking body temperature at the Syekh-Yusuf Islamic University in Tangerang is only carried out manually by monitoring the temperature checking machine and there is no data that displays the student's body temperature. This allows students with inappropriate body temperatures to pass the screening.

Testing will be carried out using the black box testing method, the black box testing technique only focuses on the information domain of the software. This research is only to measure the radiation (coverage) range of the sensor by placing the sensor in a place that is not blocked by any objects, and directing it to the object (human) to be detected. The results obtained from the sensor's transmit power coverage with various height variations show that the maximum emission is at a sensor height of 150 cm from the floor. A distance of 5 cm is the furthest point for detecting humans.

Therefore, the author is interested in creating a body temperature monitoring prototype design that can check body temperature and also collect data automatically so that the possibility described previously can be avoided. With this tool, it can help students to carry out checks without coming face to face with people who want to enter the classroom, this prototype detect body temperature remotely. In this case, management determines that people who want to enter the classroom above 37.5°C are not permitted to enter the classroom.

The materials and tools used in this research are Black Box Testing, Microcontroller, MLX90614 Sensor, ESP8266, Arduino Uno, Atmega IC, RFID Reader, Buzzer, OLED LCD, 16x2 LCD with I2c.

RESEARCH METHODS

In data collection methods to obtain information I use several methods including: 1) Observation, this method is carried out directly by researching and collecting data at the Syekh-Yusuf Islamic University, Tangerang, precisely on Jalan Maulana Yusuf No.10, Babakan, Tangerang District, Tangerang City, Banten 15118. 2) Interview, interview was carried out by communicating with the data source. This communication is carried out through verbal question and answer dialogue. 3) Analysis Method, In developing a prototype that suits the user, the author uses methods from data and tool performance results that are in accordance with the aims and objectives of making the tool. From the resulting data, researchers carried out analyzes to determine the parameters for the success of the tool.

In Design Method, the design of the device here plays a very important role because it is necessary for the operation of the tool to be made. Device design is divided into several things, namely: 1. Main Program Design. 2. Database Design. 3. Software Design.

RESULT AND DISCUSSION

1. Initial Observation

The initial observation stage is the initial stage where the researcher carries out several observations to determine several things that can be used as research.

2. Identify the Problem

At the problem identification stage, researchers discuss problems that may occur in the research process. At this stage, after initial observation, of course several problems will arise, such as when checking body temperature by humans, then to minimize direct contact between people, because direct contact can make the spread of this virus faster and also the implementation of health protocols that have not been monitored so that It is not known who

has carried out the health protocols.

3. Identify Solutions

At the solution identification stage, researchers look for ways so that each problem that emerges can be resolved. Discussion between researchers is a method for identifying solutions to problems that may occur. In this research, researchers created a tool to monitor health protocols and also reduce direct contact between people so that the spread of the virus can be avoided.

4. Determine goals

At the stage of determining the goal, after finding a solution to the existing problem, the researcher begins to design the goals that will be achieved, the goals that the researcher will achieve include maximizing efforts to prevent the spread of the virus, knowing data on the implementation of health protocols, and designing tools to avoid the escape of people with symptoms. Covid-19 entered campus.

5. Library and Literature Study

At this stage, the researcher looks for library studies and literature to find a reference that has already been carried out in further research, and is also related to the research being carried out.

6. Creation of Work Sequence

1. The design of the device here plays a very important role because it is necessary for the operation of the tool to be made. Device design is divided into several things, namely:

a. Main Program Design

This is an algorithm for all program running processes on the body temperature measuring system hardware using the MLX90614 sensor which is programmed by the ESP8266. The first step begins with initial initialization of analog ports, input/output, RFID. Where in this situation the temperature sensor is not working. If RFID has detected a registered card, the MLX90614 sensor will be active and ready to measure the temperature of the object, however if the card is not registered you can still check the temperature, but the data will not be saved to the database. If the object's temperature is detected, the ESP8266 will save the data into a database and the temperature measurement results will appear on the 16x2 LCD. If the object temperature exceeds 37°C the buzzer will sound for 1 second.

b. Database Design

The database is used to store users who have used the tool by containing temperature data, user name and blood oxygen levels if the user's temperature exceeds 37°C. This data is stored in a database for further use by the software.

c. Software Design

After obtaining the data from the user's measurements, the temperature data, user name and oxygen level in the blood are uploaded into software so that it can be seen and accessed by anyone who has used the tool.

d. Tool and Software Design

At this stage, the researcher designs the tools and software after all the data has been obtained and has been processed, determines this design also by considering field conditions for the placement of the tools.

e. Results and Analysis

At this stage, the researcher obtains the results of the tool that has been created and obtains data and results of the tool's performance in accordance with the aims and objectives of making the tool. From the resulting data, researchers carried out analyzes to determine the parameters for the success of the tool.

Tool and Software Design

Tool Design, The temperature monitoring tool consists of a box that functions as a component storage area, ESP8266 as a Wi-Fi module, MLX90614 temperature sensor as a non-contact temperature detector, RFID-RC522 sensor as a frequency detector, Heart Rate Sensor MAX30102 as a heart rate and oxygen level detector, and the 16x2 LCD functions as a display of data from the sensor.

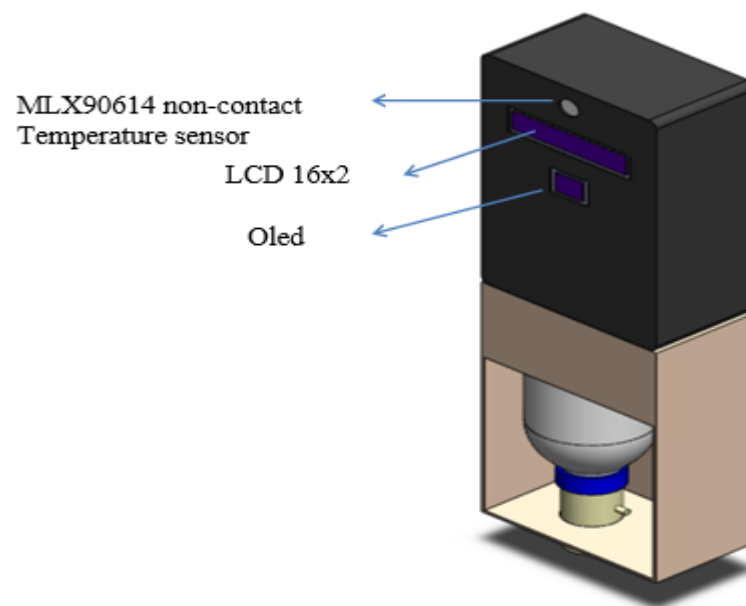
Figure Tools Design

Fig. 1 Desain Tools

Table.1 Tools and materials

No	Alat dan bahan	Spesifikasi
1	NodeMCU	ESP8266
2	Sensor suhu	MLX90614
3	Laptop	Acer
4	RFID	RC522
5	LCD 1602	16x2
6	Kabel USB	Micro USB type B
7	Kabel jumper	Male female
8	Oled	128x64 SSD1306
9	Buzzer	5 volt
10	LED	5mm
11	Modul I2C	PFC8574
12	Arduino Uno	R3

Application Design

The software was created using kodular.io, this software functions to monitor temperature as well as a place for ID registration

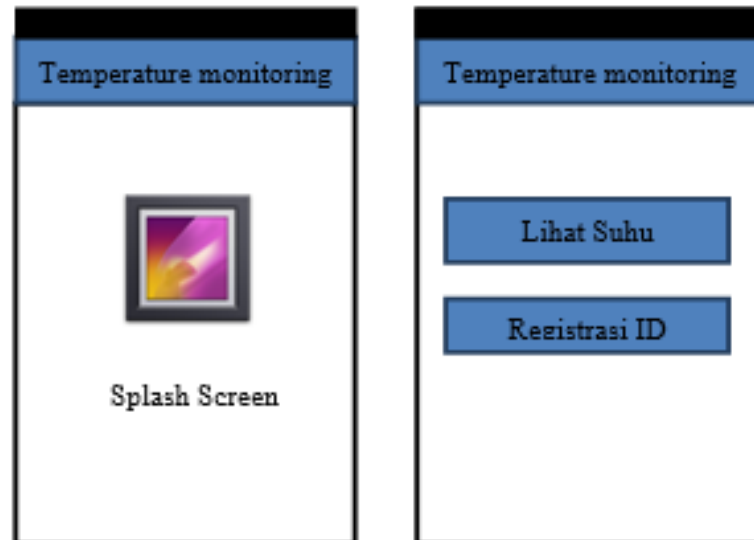


Fig. 2 first View

In this display there are two options, namely the first option, see temperature, where we can see the body temperature of other students. Apart from that, there is an ID Registration option, which is used to register our account

View Registrasion ID Design

This registration menu is used for students to register containing ID, Name and NIM. This ID registration aims to register an account so that it can be read on the temperature display.

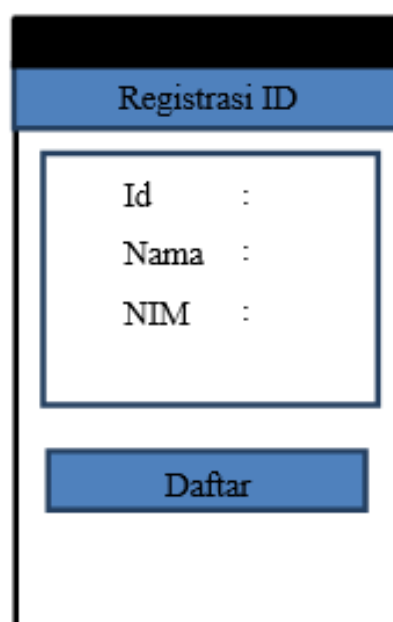
The image shows a mobile application screen titled 'Registrasi ID' in a blue header bar. Below the header is a white rectangular area containing three labels with colons: 'Id :', 'Nama :', and 'NIM :'. These labels are positioned to the left of a large, empty rectangular input field. Below this input field is a blue rectangular button with the text 'Daftar' in white.

Fig. 3 first View

Temperature Display

The temperature viewing menu displays data from each student who checked their temperature. This temperature display displays data in the form of date, name, NIM, and temperature

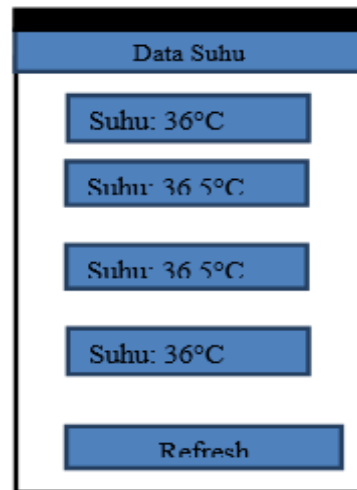


Fig. 4 Temeparur Display

System Workflow

The system workflow consists of taking information (input), processing information (processing), storing information (storage), and producing results (output).

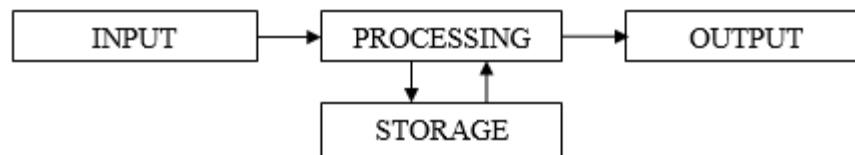


Fig. 5 System Workflow

Flowcharts Tools

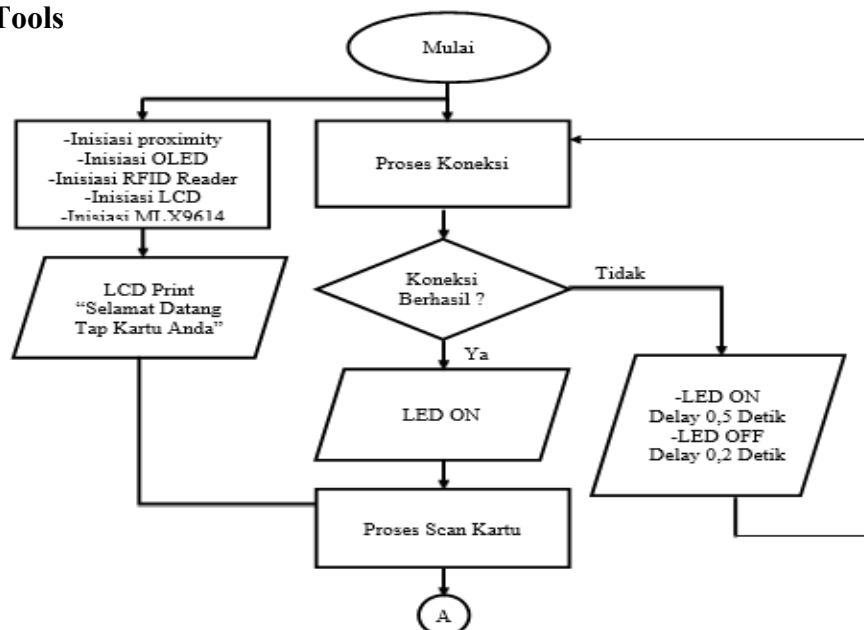


Fig. 6 Tool Flowcharts

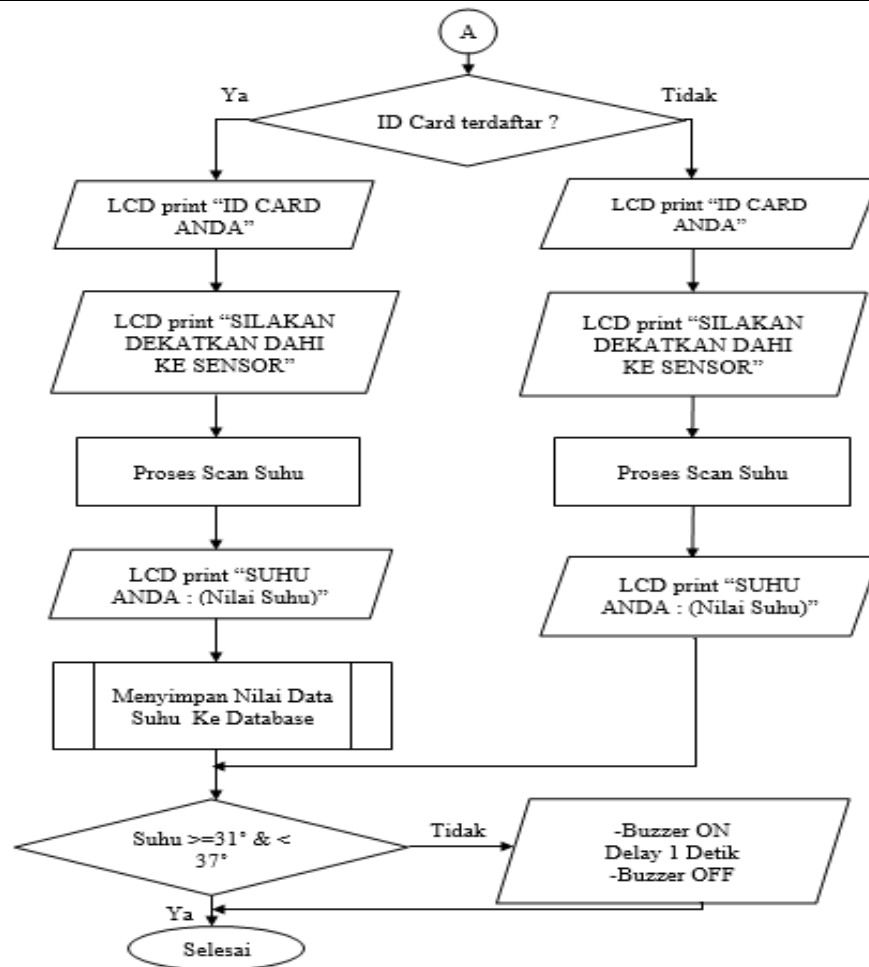


Fig. 7 Advanced Flowchart Tool

Aplication Flowcarts

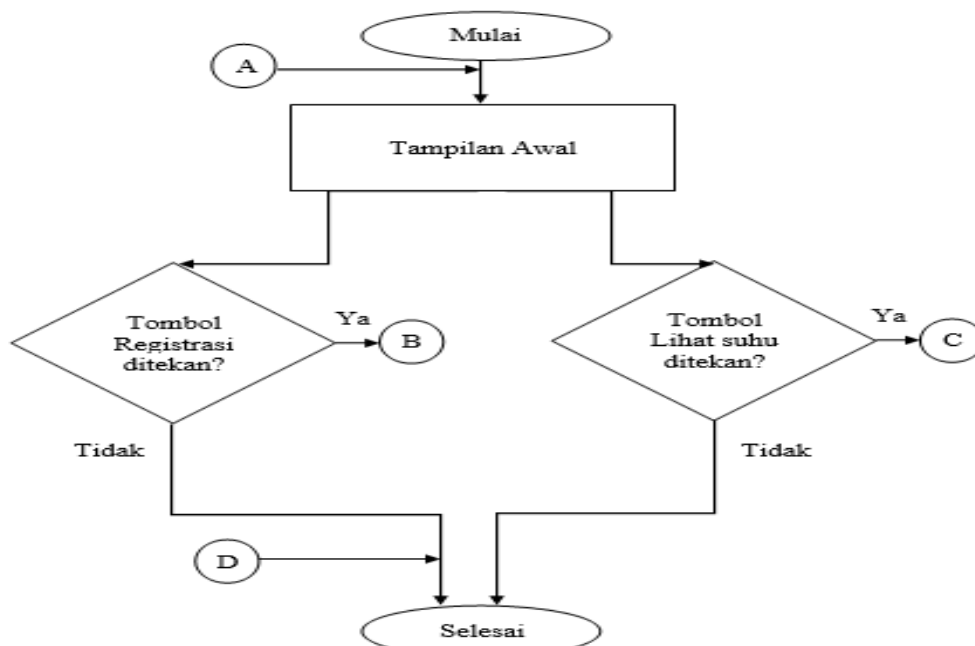


Fig. 8 Advanced Flowchart Tool

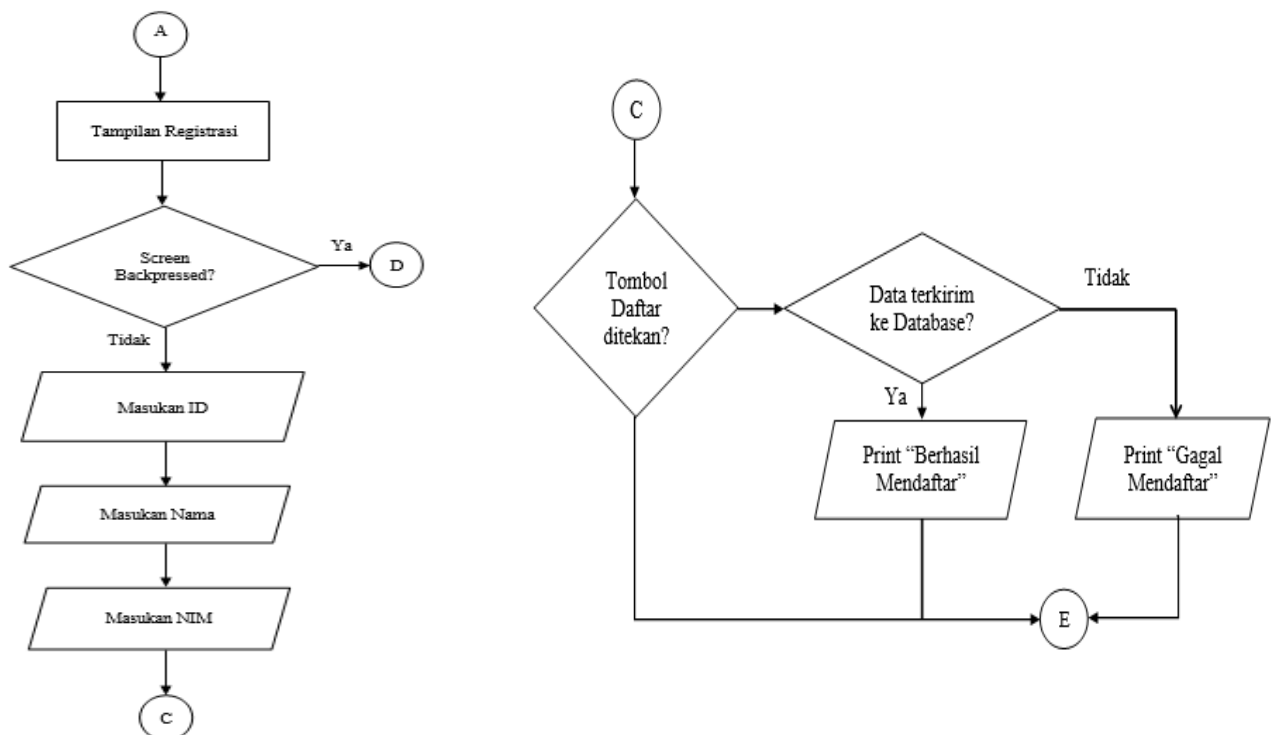


Fig. 4 Advanced Flowchart Tool

CONCLUSIONS

The body temperature monitoring prototype can save body temperature data that has been checked into a database automatically and later the data can be accessed via smartphone. The temperature data storage program from the tool was created using C++ on Arduino and connected to serial communication with the ESP8266 which functions to send data to a database which can later be accessed via an Android application created using block programming in the Kodular application so that temperature data can be displayed in the temperature monitoring application and can be accessed by all campus residents, to Suggestions ; 1) It is hoped that further research can use other applications or add other applications besides Android, such as application software so that it can also be operated via a computer, 2) It is hoped that further research can develop sensors in tools or applications to make them even better, 3) It is hoped that further research will be able to develop applications which in the future are expected to be able to recap body temperature data

ACKNOWLEDGMENT

I would like to express my sincere thanks to the lecturers who have helped with this research with direction, support and time, especially to Mr. Djamaludin, (Pak Djems) and his colleagues, and colleagues in arms who cannot be mentioned one by one, and also the staff Academic community at UNIS Informatics Engineering in particular, and study programs at UNIS, allow me to include your names in this journal, for your attention, time and permission, hopefully it will be a good deed for all of us, only Allah Subahanahuwataala can repay the kindness. Gentlemen, once again thank you very much.

REFERENCES

- Aldi, M., #1, A., Widiarto, R., Suwartika, R., & #3, K. (2021). Health Monitoring System Dengan Indikator Suhu Tubuh, Detak Jantung Dan Saturasi Oksigen Berbasis Internet of Things (IoT). Jurnal PETIK, 7(2), 2021–2043

- Apriyanti, Z., Abdullah, D., & Putra, E. D. (2021). Prototipe Sistem Monitoring Pintu Masuk Berdasarkan Suhu dengan Peringatan Informasi Display dan Suara Menggunakan Mikrokontroler ATMEGA 328. *Just TI (Jurnal Sains Terapan Teknologi Informasi)*, 13(2), 75. <https://doi.org/10.46964/justti.v13i2.753>.
- Fauziah, H. Y., Sukowati, A. I., & Purwanto, I. (2017). Rancang Bangun Sistem Absensi Mahasiswa Sekolah Tinggi Teknik Cendekia (STTC) Berbasis Radio Frequency Identification (RFID) menggunakan Arduino UNO R3. *Jurnal Ilmiah Komputasi*, 16(2), 1–2. <https://doi.org/10.32409/jikstik.16.2.2288>.
- Isyanto, H., & Jaenudin, I. (2017). Monitoring Dua Parameter Data Medik Pasien (Suhu Tubuh Dan Detak Jantung) Berbasis Aruino Nirkabel. *ELEKTUM*, 15(1), 19–24.
- Muttaqin, J., & Sirait, M. (2015). *Jurnal einstein. Bioilmi Edisi Agustus*, 3(2), 45–50.
- Saleh, M., & Haryanti, M. (2017). Rancang Bangun Sistem Keamanan Rumah Menggunakan Relay. *Jurnal Teknologi Elektro, Universitas Mercu Buana*, 8(2), 87–94. <https://media.neliti.com/media/publications/141935-ID-perancangan-simulasi-sistem-pemantauan-p.pdf>.
- Sasmoko, D., & Wicaksono, Y. A. (2017). IMPLEMENTASI PENERAPAN INTERNET of THINGS(IoT)PADA MONITORING INFUS MENGGUNAKAN ESP 8266 DAN WEB UNTUK BERBAGI DATA. *Jurnal Ilmiah Informatika*, 2(1), 90–98. <https://doi.org/10.35316/jimi.v2i1.458>.
- Sari, W., Rasyid, R., Fisika Elektronika, L., Instrumentasi, D., & Fisika, J. (2021). Rancang Bangun Sistem Termometer Inframerah dan Hand Sanitizer Otomatis untuk Memutus Rantai Penyebaran Covid-19. *Jurnal Fisika Unand (JFU)*, 10(1), 76–82. Retrieved from <http://jfu.fmipa.unand.ac.id/76>.
- Setiawan, N. D., & Ongkowijoyo, I. (2021). Sistem Monitoring Kesehatan Karyawan Menggunakan Wemos D1 Untuk Antisipasi Penularan Covid 19 Berbasis Internet Of Things. *JUPITER (Jurnal Penelitian Ilmu ...)*, 227–234. Retrieved from <https://jurnal.polsri.ac.id/index.php/jupiter/article/view/3945%0Ahttps://jurnal.polsri.ac.id/index.php/jupiter/article/download/3945/1675>.
- Pengukuran, S., Tubuh, S., Berbasis, O., Sebagai, A., Deteksi, A., Covid-19, A., ... Nurpulaela, L. (2021). 60 Iqbal Ardiyansah: Sistem Pengukuran Suhu Tubuh *Jurnal Orang Elektro*, 10(2), 2021.
- Polly, V., Pandelaki, S., & Dame, K. (2020). Alat Pendeteksi Suhu Tubuh Contactless Menggunakan Mlx90614 Berbasis Mikrokontroler Dengan Fitur Suara. *Jurnal Ilmiah Realtech*, 16(2), 49–53. <https://doi.org/10.52159/realtech.v16i2.133>.
- Rizki Pardamean Sinaga, Bambang Widodo, Susilo, Stepanus, D. E. (2020). Rancang Bangun Sistem Pengukuran Suhu Tubuh Manusia Otomatis Tanpa Kontak Fisik Dengan Sensor Suhu MLX90614 Berbasis Arduino Uno Pada Bilik Disinfektan. *Jurnal Ilmiah*, 3(September), 1–10.
- Urbach, T. U., & Wildian, W. (2019). Rancang Bangun Sistem Monitoring dan Kontrol Temperatur Pemanasan Zat Cair Menggunakan Sensor Inframerah MLX90614. *Jurnal Fisika Unand*, 8(3), 273–280. <https://doi.org/10.25077/jfu.8.3.273-280.2019>.
- Wulandari, R. (2020). Rancang Bangun Pengukur Suhu Tubuh Berbasis Arduino Sebagai Alat Deteksi Awal Covid-19. *Prosiding SNFA (Seminar Nasional Fisika Dan Aplikasinya)*, 5, 183–189. <https://doi.org/10.20961/prosidingsnfa.v5i0.46610>
- Zanofa, A. P., Arrahman, R., Bakri, M., & Budiman, A. (2020). Pintu Gerbang Otomatis Berbasis Mikrokontroler Arduino Uno R3. *Jurnal Teknik Dan Sistem Komputer*, 1(1), 22–27. <https://doi.org/10.33365/jtikom.v1i1.76>.